

AIRBORNE HIGH SPECTRAL RESOLUTION LIDAR AEROSOL MEASUREMENTS DURING CALNEX AND CARES

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ABSTRACT

The NASA Langley Research Center (LaRC) airborne high spectral resolution lidar (HSRL) on the NASA B-200 aircraft measured aerosol extinction (532 nm), backscatter (532 and 1064 nm), and depolarization (532 and 1064 nm) profiles during the 2010 CalNex and CARES field missions. During the CalNex deployment in May 2010, HSRL data were acquired during eight science flights that were located mainly over Los Angeles. During the CARES deployment in June 2010, HSRL data were acquired during 23 science flights that were located mainly over Sacramento. The B-200 flights were conducted so that the NOAA WP-3, NOAA Twin Otter, CIRPAS Twin Otter, and DOE G-1 aircraft often collected coincident data within the HSRL “curtains,” thereby facilitating extensive intercomparisons and combined analyses. The HSRL data are used to characterize the vertical and horizontal distribution of aerosols and to provide the vertical context for the airborne in situ measurements acquired from these other aircraft. Aerosol intensive parameters derived from HSRL data are used to infer aerosol types and determine the fraction of aerosol optical thickness (AOT) contributed by these types. Preliminary analyses of data acquired over the Los Angeles region during CalNex show cases where elevated layers of dust, likely transported from Asia, were located above urban aerosols. HSRL and ground-based Cimel sunphotometer and multifilter rotating shadowband radiometer (MFRSR) measurements show low (<0.1 at 532 nm) AOT values were generally found over the Sacramento region during CARES; a larger and wider range of AOT values was found over Los Angeles during the CalNex flights. HSRL measurements are also used to determine planetary boundary layer (PBL) height and investigate the spatial and temporal variability of PBL height in these regions, as well as to evaluate PBL heights derived from the WRF-Chem model. Preliminary comparisons of aerosol extinction derived from the HSRL measurements and in situ measurements of aerosol scattering and absorption on the DOE G-1 aircraft during the CARES “golden day” on June 28 show good agreement; additional analyses combining the HSRL data with airborne in situ measurements are underway.

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